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ABSTRACT

In the development of a model for evaluating media for the handicapped, it is found that mere recognition of numbers is not sufficient preparation for training primary level educable mentally retarded (EMR) children to respond meaningfully via an automated response system. This study, based on the findings of a previous investigation, attempted to demonstrate a method for training young children to respond to test items presented in an automated system. The study consisted of four phases: (1) initial training, (2) first film, (3) pilot group, and (4) other groups. The results of the study suggest that, by adapting the materials and question items used to the capabilities of the subjects (i.e., by dealing only with simple and concrete information), primary grade EMR children can benefit from the content of primary level films with a minimum of assistance. Furthermore, it is suggested that there exists a need for more careful consideration of: (1) the appropriateness of films, (2) the format of question items, and (3) the possible benefit of more frequent training sessions and/or cooperation within the classroom so that learning can be reinforced, transferred to new situations, and practiced. The appendix describes the training material used in the experiment. (Author/WCM)

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Research Report #741 - (Replicate 7224)
Rebecca Salon
January 1974

TRAINING PRIMARY EMH CHILDREN TO USE AN AUTOMATED STUDENT RESPONSE SYSTEM (SRS)

ABSTRACT

In the development of a model for evaluating media for the handicapped, it was found that mere recognition of numbers was not sufficient preparation for training primary level educably mentally retarded children to respond meaningfully via an automated response system. This study, based on the findings of a previous investigation, attempted to demonstrate a method for training young children to respond to test items presented in an automated system. The study consisted of four phases: (1) initial training, (2) first film, (3) pilot group, and (4) other groups. The results of the two methods employed suggest that, by adapting the materials and question items used to the capabilities of the subjects (i. e. by dealing only with simple and concrete information), primary EMR children can benefit from the content of primary level films with a minimum of assistance. Furthermore, it is suggested that there exists a need for more careful consideration of (1) the appropriateness of films, (2) the format of question items, and (3) the possible benefit of either more frequent training sessions and/or cooperation within the classrooms so that learning can be reinforced, transferred to new situations, and practiced.

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IR 000 667

SPECIAL REPORT No. 74
COMPUTER-BASED PROJECT for the EVALUATION of MEDIA for the HANDICAPPED

Title: TRAINING PRIMARY EMH CHILDREN TO USE AN AUTOMATED STUDENT RESPONSE SYSTEM

BACKGROUND

The Computer Based Project for the Evaluation of Media for the Handicapped, based on contract #OEC-9-423617-4357 (616) between the Syracuse (N.Y.) City School District and the Media Services and Captioned Films Branch, Bureau of Education for the Handicapped (United States Office of Education) for the five year period July 1, 1969 through June 30, 1974. The major goal is to improve the instruction of handicapped children through the development and use of an evaluation system to measure the instructional effectiveness of films and other materials with educable mentally handicapped (EMH) children, in-service training and media support for special teachers, and studies related to the evaluation process and the populations used.

The Project has concentrated on the 600 films and 200 filmstrips from the Media Services and Captioned Films (BEH - USOE) depository; however, specific packages from Project LIFE, various elementary math curricula, and selected programs from Children's TV Workshop have also been evaluated. The evaluation model used requires that: 1) objectives of materials be specified and written; 2) instruments be constructed to test and measure effectiveness; and, 3) children be the major sources of evaluation information. A number of instruments and methodologies are employed in the gathering of cognitive and affective data from 900 EMH children and 80 special teachers to make the effectiveness decisions. Over half of the EMH population can neither read or write; therefore, a unique Student Response System (SRS) is employed, consisting of a twenty station G.E.-1000 SRS which can be operated in a group or individual recording mode and is connected to a remote computer system. The computer capabilities consist of remote telephone connections to the Rome (N.Y.) Air Development Command, the Honeywell time-shared network, and the Schenectady (N.Y.) G E Research and Development Center; and batch mode capabilities of the Syracuse City Schools, Syracuse University, and various commercial sources.

In-service and media support activities provide on-the-job training for teachers, teacher aides, equipment, and materials to the special teachers in the city schools. The research activities have centered around investigations and special problems related to the development of the evaluation model. The four major areas considered are: 1) testing effects, 2) captioning effects, 3) special student characteristics; and, 4) evaluation procedures validation.

Documentation of the major activities appear in the five annual reports and the 600 evaluations prepared on materials used. Staff members were encouraged to prepare special reports and the attached paper is one of these. The opinions expressed in this publication do not necessarily reflect the position or policy of the Computer Based Project, the United States Office of Education, or the Syracuse City School District, and no official endorsement by any of the agencies should be inferred.

Research Report #741 - (Replicate 7224)
Rebecca Salon
January 1974

TRAINING PRIMARY EMH CHILDREN TO USE AN AUTOMATED STUDENT RESPONSE SYSTEM (SRS)

The Computer Based Project for the Evaluation of Media for the handicapped stated as a fourth year objective "2.3... to improve the effectiveness of the evaluation system ... (CBP, 1972)." One of these improvements was the training of primary level educable mentally handicapped (EMH) children to use an automated student response system (SRS). Morris (1971) found that training primary level EMH children to use a response device to indicate their choices for a question improved the reliability of criterion test scores. Due to the incompleteness of the data in that study, the questions of how much training and what kind of training seems to work best were not really addressed. Therefore, this study will replicate and expand the investigation of training variables.

Morris had demonstrated that very young EMH children (CA: 6-7 years) could be trained to use the SRS System. That is, the children indicated the correct response to a numeral displayed on a wall screen in front of a group. Specifically they identified the same number on the button of the desk responder unit and depressed it to obtain a reinforcing stimulus (a blinking light). He found that the younger the group, the less likely it is that they will exhibit the appropriate behavior. (Bond (1972) extended the training to get primary EMH children to respond to multiple-choice items. He and Morris implemented training consisting of a great amount of repetition based on simple concepts known in the experience of the responder (i.e , parts of the body, teacher's name, counting, etc.).

Morris also found that having adults make personal, one-to-one, on-the-spot, observations and corrections of children's difficulties greatly improved the frequency of correct choices, even when the children began to show signs of fatigue and boredom. In another study, Spaid (1970) found that about half of the primary EMH children in his sample could match a numeral intended as a stimulus and select a like number from a string of possible answers.

These above studies suggest that primary level children can be trained to use the SRS System and that the mere recognition of numbers is not sufficient to develop a response to a multiple-choice item. This study demonstrates a training method for developing response behaviors in primary EMH children to items presented in an automated system such as the SRS.

By dividing the training question into steps, data can be more readily collected and the issues and limitations of the original report can be clarified to make the training more effective. The specific questions are whether primary children can be trained to:

1. select an answer to a multiple-choice question based on knowledge gained from a film;
2. associate the answer selected with the corresponding number in the multiple-choice question;
3. transfer this number to the SRS System and indicate the response by depressing the appropriate button; and
4. associate the confirmation of their response with the fact that the correct response to the multiple-choice question was selected.

METHOD

The procedures are presented in four sections: Initial Training, First Film, Pilot Group and Other Classes. A description of the procedures is followed by a summary of the results found in that phase of the study.

INITIAL TRAINING

Subjects. The subjects in this experiment were members of five primary classes for the educable mentally retarded in an urban public school system.

Limitations of the Study. With respect to the classes themselves, the attendance varied radically from week to week. The investigators never had the opportunity to assess the abilities and/or learning disabilities of all the children with whom they were involved. The investigators had the opportunity to work with their class for only 45 minutes once a week. Progress could be expected to be slow, where a consistent program, a great deal of repetition, and the reinforcement of the concepts being taught was lacking.

Procedures. The method used for the initial training session was the same for all five classes. In training these children to be able to appropriately respond to the SRS System, the initial goal was to establish number matching which involved recognition and identification of the numerals one through five. This goal was accomplished by reinforcing the concept of sameness with respect to form using various materials. These materials included number cards with the numerals "1," "2," "3," "4," "5," printed on them, the various geometric shapes like a circle,

square, and triangle, and various combinations of three alternative and four alternative, multiple-choice questions about numbers, colors, and geometric forms (See Appendix). The rationale for using this method for the initial training sessions is that before the children can give usable data, they must be instructed in both the operation of the system and in how to respond to a multiple-choice question. Therefore, they had to be able to select the correct response and associate it with a number; they then had to express this by pushing the button that was the same as that number.

RESULTS

In all the groups, the children were given individual attention during the first session. In subsequent sessions, only the children that obviously did not understand how to respond (as observed by the investigator or teacher) were assisted. Assistance consisted of adding more structure to the question and to the way in which each child was to respond by explaining the task (i.e., helping the child first identify the alternative that answers the question, then aiding the child in associating that choice with the appropriate number by rereading the question to the child while indicating, either verbally or by pointing, the number on his desk associated with each alternative). Training with the number, color and form questions was used for two sessions only. On the third session for each of the 5 classes, a first film was shown and questions to respond to were asked All the classes showed both success and understanding of the training situation which was interpreted as an indication of readiness for this next step in training.

The criterion for success at this stage of training was that 90% of the children could respond to the training items with little or no assistance.

Each of the investigators working with the classes had noted those children who exhibited the most confusion and greatest difficulties so that special attention and assistance be given these children in an effort to raise their level of functioning to that of the rest of the class. It was also recommended for some of the classes that the number matching items be given to recheck responses before their first film question set (i.e., #4101, #1501, #2501).

FIRST FILM

PROCEDURE: The method used with the first primary film the children were asked to respond to followed the research testing design normally used in testing in the SRS room. Each of the five classes was shown a film and then asked to respond to multiple-choice questions. Three of the classes were shown the same film (#1573) and responded to a set of simple 3-choice questions, written by one of the investigators, dealing with the film they had seen. A fourth class was shown a different film (#1455) and given 2-choice questions written especially for training dealing with the film. The fifth class was shown another primary film (#1235) with the question set that would have normally been used to accompany that film if it was being used for data collection (except that the pretest items had been eliminated).

RESULTS

A. In the three classes who responded to 3-choice questions, it was noted by the investigators that (1) the children experienced a great deal of confusion, (2) more than 75% of the children could not succeed at all without a great deal of individualized attention, (3) there appeared to be too much information for the children to process at once, (4) there was very little abstraction of material and information from the film, and (5) there is a need for simple films and concrete question sets for these children .

B. The class given the 2-choice questions experienced a great deal of success, i.e., 6 children needed no help and the remaining 5 were successful after some additional explanation. Testing of the fifth class was abandoned after four questions when it was noted that the children were so confused that they would wait for a cue to indicate that the question was over, indiscriminately push a button, and make no association between confirmation and having chosen the correct answer. It was recommended at this point that only concrete questions be used during training and that correct response to the questions should require a minimal amount of abstraction of concepts from the film.

PILOT GROUP

PROCEDURE: A pilot group was started six weeks prior to the time training began for the other four groups. Various steps were tried with this pilot group so as to ascertain possible effective starting points for the other four classes. Initial training of this group was limited to

two 45-minute sessions. All sessions, after the initial training period, involved showing a primary level film and having the children respond to posttest cognitive questions. The nine-step pilot group training consisted of

STEP I - INITIAL TRAINING - Items used at this step were based on previous knowledge (i.e., simple concepts known in the experience of the responders).

STEP II - FIRST FILM - The group was shown a primary level film and asked to respond to multiple-choice items based on information about the film and not necessarily based on previous knowledge.

STEP III - The group was shown a primary level film and asked to respond to a normal Trial A format set of questions. (i.e., The set of questions contained 10 questions alternating between 5 questions based on the film they have just seen with 5 questions from a primary level film they have not yet seen.)

STEP IV - The group was shown a primary level film and asked to respond to a Trial B format set of questions. (i.e , All the questions in the set pertained only to film the children had just seen). Items were selected from those already prepared or were re-written, if necessary, so that the answer to the 3-choice question would be obvious.

STEP V - After viewing a primary level film, the children were asked to respond to either 2-choice or very obvious and concrete 3-choice questions.

STEP VI - The class was shown a primary level film and was then asked to respond to 2-choice items with the stem in the form of a question.

STEP VII - This step was the same as Step VI with two additions. First, the film was accompanied by discussion to point out information in the film and to reinforce the connection between what is to be done and how to do it. Also, the questions were presented auditorally but not visually so as to minimize the stimuli to be processed.

STEP VIII - This step was the same as Step VII except that 3-choice items were used rather than 2-choice items. Also, the numbers of the choices ("1," "2," and "3") were further reinforced using number cards to accompany the choices as they were being read.

STEP IX - This step is represented by the description given under Criterion II. Two other groups followed a developmental approach similar to that of the pilot group so as to achieve Criterion II. The two remaining groups sought to attain Criterion I and followed a program to be outlined under OTHER GROUPS.

Criterion one -- In keeping with the research design of CBP, this criterion will have been met, using Trial B items, when 60% of the class is able to give usable data (i.e., responding to an item after exhibiting an understanding of the relationships involved and of what is required).

Criterion two -- It was felt that by altering the research design of the project and adapting it to the capabilities of the EMH children involved, 90% of the children could be expected to give usable data. By this it is meant that given questions written using concrete language, dealing with content rather than concepts, and presented orally but not visually, the children will be able to give a response to these questions that would indicate a knowledge of the operation of the system with respect to their performance.

RESULTS. The children demonstrated a high degree of success during initial training (i.e., they could respond correctly unassisted to 90% of the items. Details pertaining to the results for Initial Training and First Film can be found in those respective sections of this paper. The lack of apparent transfer of learning from initial training to first film may have been due to the degree to which the children were unfamiliar with the content in the items rather than any confusion regarding the operation of the SRS. Blount (1971) had previously noted from observations of mentally retarded children that when one stays within the conceptual framework of the retarded child, in this case by using items known to be familiar to him, the retarded child can and does operate conceptually (at least in part) in a manner not significantly different from other children with the same mental age. When presented with unfamiliar material, the children exhibited little or no success.

In Step III, using a set of items containing questions both from the film the class had just seen and one not seen, the class was no better able to respond to items that pertained to the film they had just seen than they were able to respond to those items that were pertinent to

other films. Responses were in the form of random guessing for the entire class. This observation raised the question of whether or not the children were able to successfully abstract information from the films. This led immediately to Step IV in which a test consisting of items only from the film seen was used exclusively. But even with items having obvious answers, the class showed no apparent understanding of what was required. For some children, even one-to-one assistance could not clarify the process involved so that they could select the correct answer, relate it to the corresponding numeral, and press that button on their desks. Random guessing still prevailed. To further simplify the process of choosing an answer and relating it to a numeral, the following week Step V was implemented. The classes experienced success and finally exhibited an understanding of the process but only when individual attention was given to all the children. This individual attention involved additional explanation of either the question itself, the concept from the film, and/or the way in which to indicate the response. Because of this, the class remained at this step an additional week so that the investigator had the opportunity to re-evaluate this method and the individual children Again, the only success the children experienced was when it was prompted by the investigator and it was noted that there was no understanding of the "confirmation" of a correct response. In the next session, the questions were formated into a 2-choice format described in Step VI which Mehrens and Lehmann (1973) have recommended as the simplest multiple-choice format for use with primary age children.

The children experienced inconsistent success but some did seem to be connecting the response given with the answer to a question. At this point, the investigators noted that the children were responding more to cues than to the content of the questions. Even though the cognitive resources of the children were adequate for successful response to the items, the children tended to distrust their own solutions because of so much previous failure.

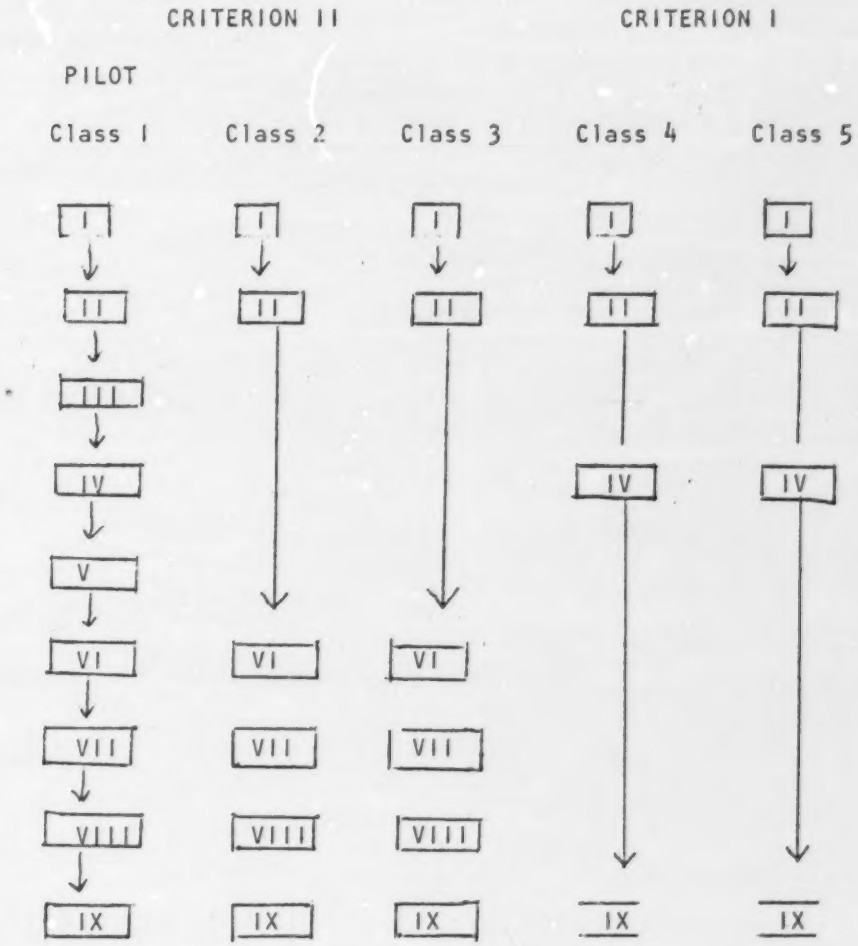
Zigler (1973) pointed this out as well noting that the retarded child, rather than trusting his own choice would exhibit "a greater sensitivity to external or environmental cues, particularly those provided by social agents in the belief that these cues would be more reliable indicators than those provided by his own cognitive efforts."

From this point on in the training, the investigators offered a minimum of assistance or support to the children so as to receive a better indication of the progress of the individuals in the classes.

In lieu of the adult assistance with the questions themselves, Step VI was modified into Step VII and the following week Step VII was further modified into Step VIII. At Step VII 3 out of 6 or 50% of the class were able to independently respond to the specially prepared items Step VIII was continued for 3 weeks before the investigator felt sure that Criterion II had been achieved. In those 3 sessions, 4 out of 6, 5 out of 6, and 6 out of 6 children respectively had been able to independently respond and reliably operate the SRS to indicate their responses.

OTHER GROUPS

PROCEDURES: Training procedure as followed by the other four groups consisted of the elimination of one or more of the above steps from the activities the class would participate in. A summary is shown in the figure below. Step III and V were deleted for all four groups as they were not shown as having been effective supplements to the training process.



The goal of the two groups trained to achieve Criterion I was to obtain reliable and usable data from 60% or more of the children. Following

their initial training and first film, these groups would continue in a Trial B format (where they receive only items related to the film seen). The item sets were carefully screened and inappropriate items re-written if necessary, in order to assure the children in these groups consistent success in their response to 3 alternative multiple-choice items. Therefore, these two groups began with Step IV and continued at this step until 60% or more of the children were correctly operating the SRS.

It was the goal of the two groups trained to achieve Criterion II to find a more effective item format for primary EMH children. Items dealing with the more concrete content of the films were written to determine if a more reliable response would be produced for the film being evaluated. The use of concrete questions (see Appendix) enabled the investigators with Criterion II groups to determine how much information the children were able to abstract from the films while learning to operate the SRS. The concrete items seemed to provide an observably more consistent success rate for the children which would facilitate training. Therefore, after the initial training and first film, these groups began at Step VI and followed the pilot group through to Step IX for Criterion II (i.e., Step VI, VII, VIII, IX).

RESULTS - Criterion I Groups

It was found that, given individual attention, 60% or more of the primary EMH children can be trained to independently and reliably operate the SRS and contribute usable data for the evaluation of primary films

after an average of 6 sessions at Step IV. It was further found that, 60% or more of the children could be trained to select an answer to a multiple-choice question based on knowledge gained from a primary level film, and could associate the answer selected with the corresponding number in the multiple-choice question. Also 90% of the children could transfer a selected numeral to the SRS and indicate the response by depressing the appropriate button as was noted in Initial Training.

Table I - Progress of Primary Training

Class	Sessions							
	1	2	3	4	5	6	7	Now
Criterion II								
Class 1								
Independent	4/6	5/6	6/6					6/6
Class 2								
Independent	5/5	7/7						7/7
Class 3								
Independent	4/6	6/7	7/7					
Criterion I								
Class 4								
Independent	4/11				3/11	6/11	6/10	9/12
With Assistance	6/11				4/11	3/11	2/10	
Class 5								
Independent	6/11	6/11	5/10	5/10	6/10			9/10
With Assistance	5/11	5/11	4/10	4/10	3/10			

The data in this table represents the ratio of the number of children contributing usable data to the number of children available at each session. The data for Criterion II groups represents their progress at Step VIII; the data for Criterion I groups represents their progress at Step IV. The Criterion I group data is divided further into the number of children operating independently and those that needed assistance in each session.

RESULTS - Criterion II Groups

It was found that, given items presented with (1) the stem in the form of a question, (2) the language kept simple and concrete, (3) previous assistance in abstracting information from films through discussion, (4) auditory stimuli only, and (5) use of the number card "1," "2," "3," to further reinforce the number associated with each alternative in the item, it can be expected that 90% of the primary EMH children will relaiably select the corresponding correct answer thereby contributing usable data for the evaluation of primary films.

CONCLUSIONS AND RECOMMENDATIONS

Although this study was limited with respect to time periods, attendance, and the fact that there was no measurement of the transfer of the methods and materials used during training to any learning experiences outside the SRS, the evaluation of films by primary EMH children was made possible with training. Prior to this study, the five primary level groups involved were not able to respond reliably to items. The results of the two methods employed suggest that, by adapting the materials and items used to the capabilities of the subjects (i.e., by dealing only with simple and concrete information), primary EMH children can benefit from the content of primary level films with a minimum of assistance.

It was further noted that there existed a need for more careful consideration of (1) the appropriateness of the films themselves, (2) the question items and their format, and (3) the possible benefit of either more frequent training sessions and/or cooperation within the classrooms so that the learning can be reinforced, transferred to new situations and practiced frequently.

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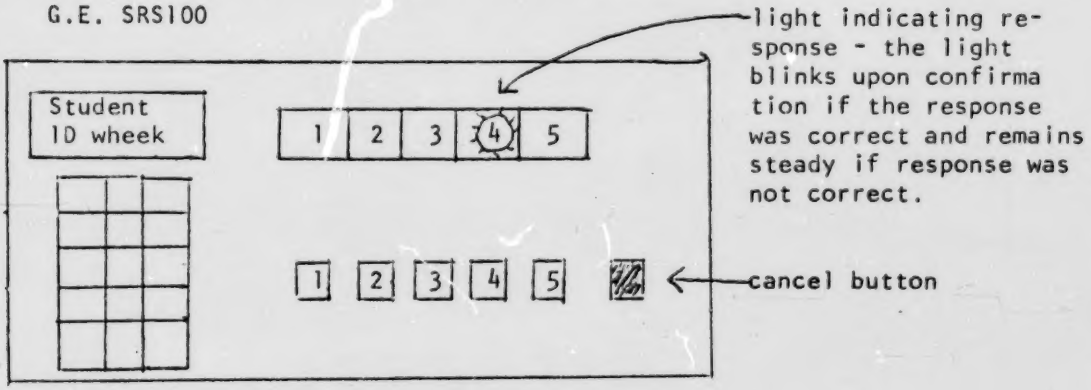
APPENDIX

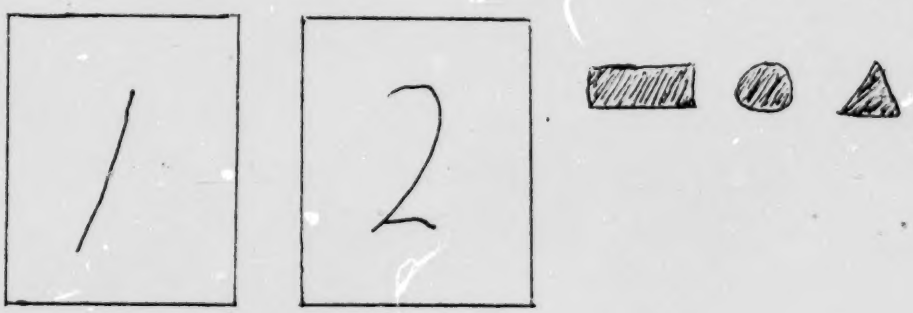
INDIVIDUAL RESPONSE PANEL located in each desk

G.E. SRS100


Student
ID wheek
1 2 3 4 5
1 2 3 4 5
light indicating response - the light blinks upon confirmation if the response was correct and remains steady if response was not correct.
cancel button

INITIAL TRAINING MATERIALS on 5''x8'' white cards printed with the numerals 1;2;3;4; or 5 or with the geometric shapes

Examples:



MULTIPLE CHOICE INITIAL TRAINING QUESTIONS - on overhead transparencies.

Examples: Push the button that looks like this.

5

Push the button that looks like this.

2

Push button number one.

1

2

3

4

5

Push button number three.

1

2

3

4

5

Push the button for the number of eyes you have

1

2

3

4

5

Push the button for the number of noses you have.

1

2

3

4

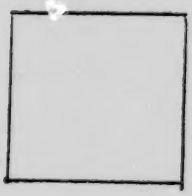
5

What color is this?

1. red
2. blue
3. green
4. yellow

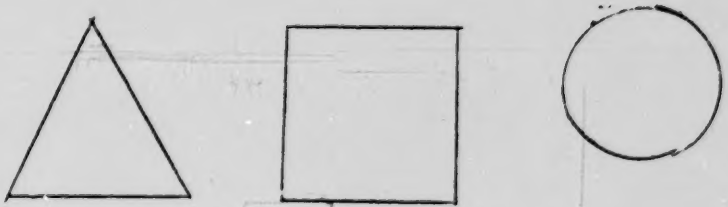
What is this?

1. square
2 circle
3. triangle



What color is the triangle?

1. yellow
2. blue
3. green
4. red



Training Questions Pertaining to Primary Films

Examples of the types of questions used will be discussed from three primary films, all of which had previously been judged appropriate for primary EMH children with respect to content and vocabulary. For the purposes of discussion, examples of questions from the films will be included. The films will be The Lonely Scarecrow (1524; Seven Little Ducks #1235; and The Ugly Duckling #1573.

The Lonely Scarecrow was both content and vocabulary appropriate but the information was presented in a way that made it difficult for the children to abstract concepts and information. This film not only presented a great deal of information, both auditorily and visually, but was also narrated by the scarecrow, all of which seemingly interfered with the film's effectiveness as a teaching device.

Example - question for Criterion I which presented a problem to the children

Why are crows pesty to farmers?

1/ they make noise
2/ they build nests
*3/ they eat seeds

Example - question for Criterion II for which 60% of the children responded incorrectly. When questioned concerning their response (i.e., asking "Are crows (birds that are red?" (little white rabbits?" the children responded "Yes")

What are crows?

*1/ birds that are black
2/ little white rabbits
3/ birds that are red

or by asking them the question individually (i e., "What are crows?" some responded "little white rabbits" or "birds that are red") it became obvious that there was more information than the investigators had realized that the children had not been able to abstract from the film. Apparently Step IX had not been achieved although the children could respond to the questions using the SRS and understood how to operate the SRS. It was because of the results of this film that the three Criterion II groups found it necessary to include discussion with the presentation of the films (Step VII) to make the children aware of the content of the films and to get the children to the stage where they could abstract information and concepts from the films by themselves.

In the film Seven Little Ducks, some of the questions also required a great deal of cognitive ability where the information has to be generalized about or related to other information. Examples of questions from these films that were used with both groups of Criterion I include:

A duck is shaped like a boat to help him:

*(1) float
(2) eat
(3) walk

A baby duck has soft feathers called:

(1) fluff
(2) fur
*(3) down

Ducks dig in the ground for:

*(1) worms
(2) grass
(3) water

Questions used initally in training with films, when the priority was getting the children to reliably operate the SRS (i.e., emphasis was not as great on the selection of an answer as it was on effectively expressing this selection as stated in points 2, 3, and 4 of the hypothesis), were less concerned with content and dealt with information that the classes could easily respond to.

Examples of questions used at this stage of training for the film The Ugly Duckling for Criterion II groups include:

Can ducks swim?

*(1) yes
(2) no

What color was the ugly duckling?

(1) red
*(2) white

What did the ugly duckling do when he was sad?

(1) laugh
*(2) cry
(3) smile